Copies sent Supervisor + Rangers 2 Ranger List - 8/3/59 om
2 cys to John Pierce - 8/3/59
APT (2) + 1 ea Bill Heimann, Dennis - 8/3/59 om
DJE - 8/3/59 om
cc Howden - 8/3/59 om
cc Abell - 8/3/59 om

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Timber Management

FOREST PEST CONDITIONS IN CALIFORNIA 1958

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cc Van Fiance (GAO auditor) - 4/5/60 - xc
cc John Lindeman, USFWS - 8/3/59 om
cc USFWS Wildlife Atty Nelson Elliott - 8/3/59 om
cc Arthur I. Bischoff, Asst Game Mgr, State Dept Fish & Game, Sacto 8/3/59
cc E. G. Hunt
2 cc Benedict Whitehead - W.O. - 8/3/59 om
3 cys sent Mr. Earl Wothe, Groveland, Calif - 7/30/59 om

6 eptwas attached

1 Copy circulated SPA for TM om
cc TMH, 3 ha - 7/31/59 om

116 om land
withdrawn for 125
9/30/59 om

TIMBER MANAGEMENT

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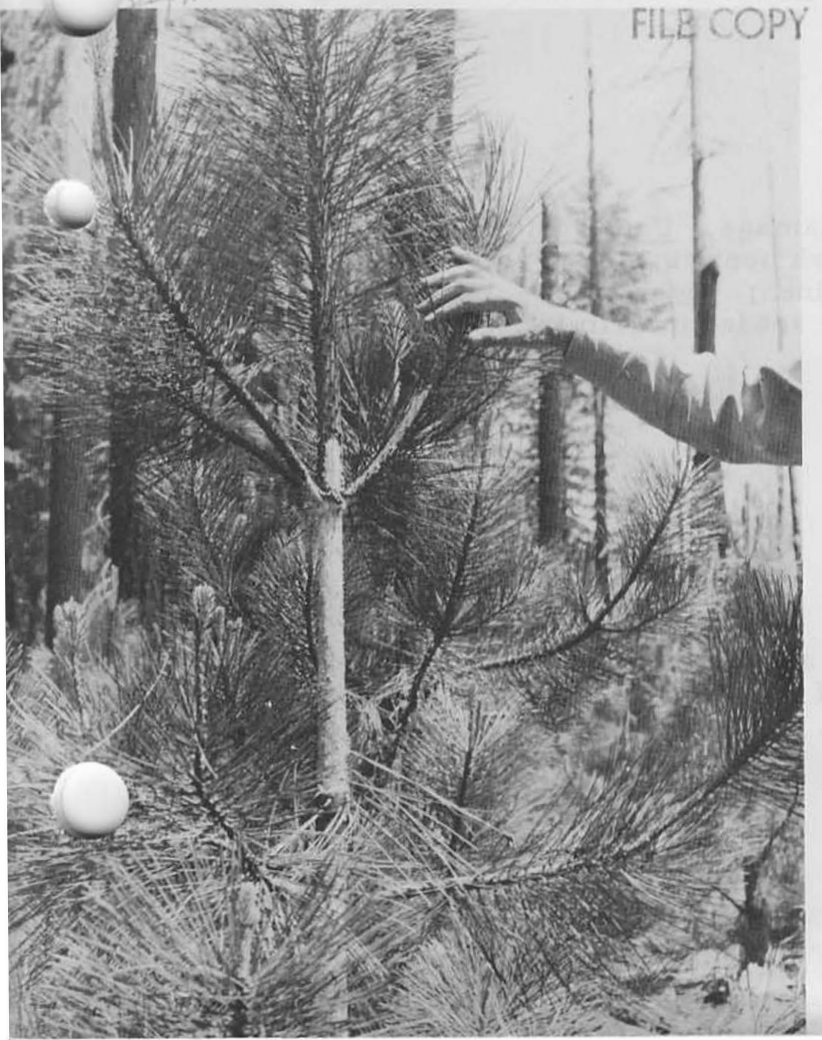


The California Pest Control Action Council is composed of representatives of the following organizations:

California Forest Protection Association

State of California Bureau of Entomology

State of California Department of Fish and Game

State of California Division of Beaches and Parks

State of California Division of Forestry

U.S. Bureau of Indian Affairs

U.S. Bureau of Land Management

U.S. Fish and Wildlife Service

U.S. Forest Service

U.S. National Park Service

University of California

Western Pine Association

Cover: Examples of forest pest damage. Upper left - sawtimber-size trees topkilled by bark beetles; lower left - pine sapling girdled by porcupines; lower right - Jeffrey pine limb infected with heavily seeded dwarfmistletoe.

Prepared by the California Forest and Range Experiment Station in cooperation with other members of the Council. Printed and distributed by California Division of Forestry. Additional copies available from either of these sources.

FOREST PEST CONDITIONS IN CALIFORNIA

As Revealed by Surveys During 1958

Official Report of the

CALIFORNIA FOREST PEST CONTROL ACTION COUNCIL

Sacramento

April 1959

CONTENTS

	Page
Summary of Forest Pest Conditions	3
Surveys of Forest Pest Damage	4
Status of Major Forest Insect Pests During 1958	6
The Insect Control Program Endorsed for 1959	16
Accomplishments of Recent Control Action	17
Status of Major Forest Diseases During 1958	20
Recommended Action on Major Forest Diseases	28
Status of Forest Animal Pests During 1958	29

SUMMARY OF FOREST PEST CONDITIONS

FOREST INSECTS

In 1958, losses due to forest insects were severe in some areas, but lower than usual in others. Surveys indicated that the amount of timber killed was below recent years. Sawtimber mortality probably did not reach the 1952 level of 1.36 billion board-feet listed for California in the U.S. Department of Agriculture's Forest Resource Report 14. Extensive salvage operations helped reduce the loss; nevertheless insects took a heavy toll. Besides their inroads on the timber supply, they continued to damage the growing stock and ruined much of the tree seed crop. Their depredations on game browse became a cause for concern.

Following is the status of major insects:

WESTERN PINE BEETLE in ponderosa pine decreased to a low level over most of the State, except southern California.

MOUNTAIN PINE BEETLE in sugar pine decreased sharply in most localities; in lodgepole pine infestations generally increased.

LODGEPOLE NEEDLE MINER in lodgepole pine remained epidemic in areas of previous outbreak; one new infestation was discovered.

JEFFREY PINE BEETLE remained abundant in some Jeffrey pine stands where it was epidemic last year and increased in some others.

CALIFORNIA FLATHEADED BORER in ponderosa and Jeffrey pine normal over most of the State, but epidemic in some areas in southern California

DOUGLAS-FIR BEETLE in Douglas-fir increased very little above the generally low level of the past 2 years.

FIR ENGRAVER in true firs increased slightly from a very low level in 1957.

PINE ENGRAVERS in various pine species at a low point during the spring and summer months, but increasing sharply at year's end.

FOREST DISEASES

Combined results of plot surveys and detection reports showed that damage from forest diseases of conifers in California during 1958 was comparable to that reported in 1957. Due to the unusually wet spring and summer of 1958 foliage diseases and blights of several hardwoods--black oak, California-laurel, poplar, and willow--became epidemic in many areas. Heart rots, dwarfmistletoes, and white pine blister rust continued to be the most destructive disease pests in the State.

The status of major diseases is:

DWARFMISTLETOE remains widespread and is causing considerable growth loss and mortality in red fir, Jeffrey pine, ponderosa pine and sugar pine throughout the range of these species. Significant damage to Douglas-fir is confined to Siskiyou County.

ELYTRODERMA needle disease of ponderosa and Jeffrey pines is causing noticeable damage at many locations in the State.

WHITE PINE BLISTER RUST continues to intensify on white pines in northern California. Southwest Tehama County and central Tuolumne County still mark the southern limits of spread.

YELLOW WITCHES' BROOM in red fir continues to damage the crown of trees of all ages at some locations in the central and southern Sierra Nevada. One heavy infection center was noted in eastern El Dorado County.

"X-DISEASE" (of unknown cause) on the San Bernardino National Forest is extending into new areas and is damaging and killing ponderosa pines of all ages. This disorder affects the entire crown uniformly.

HEART ROTS take a large and steady toll of our total timber resource every year. But they do not fluctuate much from year to year; hence there is little point in attempting to make an annual appraisal of this loss.

FOREST ANIMALS

Fragmentary information indicates that the status of animal damage is as follows:

PORCUPINES - Extensive damage continued except on forested areas where control has been conducted.

SEED-EATING RODENTS continued to cause extensive damage throughout the timber region, especially in areas where regeneration is dependent on the natural seed supply.

SURVEYS OF FOREST PEST DAMAGE

Federal and state forestry agencies and many other organizations, public and private, spearheaded by the California Forest and Range Experiment Station, participated in surveying forest pest conditions throughout the State in 1958. This work was sponsored by the California Forest Pest Control Action Council. Cooperation is the keynote to success in pest surveys, just as it is in many other endeavors, and most of the groups that currently comprise the Council have been working together in the cooperative pest detection program since 1951. This program, developed and strengthened over the years, forms the basis for most of the information in this report.

Nineteen fifty-eight was another year of steady growth and improvement in the cooperative pest detection survey. The Station, acting as a clearing house for detection reports, received a total of 361 reports of pest damage - 25 percent more than in 1957. Of these, 289 dealt with insect damage, 67 with disease damage, and 5 with animal damage. Some of these reports required only an acknowledgment. Station technicians were able to evaluate many others and make simple control recommendations from the information the reports contained. A goodly percentage, however, concerned pest conditions serious enough to require checking on the ground. Station entomologists made followup examinations on 39 insect detection reports during the year; 7 more await investigation early in 1959. Eight of the disease reports required followup.

Cooperative pest detection surveys on the ground are supplemented by aerial surveys of the State's forested areas. Lately most of this work has been done in the spring months rather than in the fall as in former years. The Station's scheduled aerial survey program, staged during April and May, operated on a somewhat reduced scale in 1958. It totaled only about 60 hours. The administrative branch of the Forest Service made available a Cessna 180 aircraft for this work. One improvement inaugurated this year was more prompt ground-checking of conditions observed from the air. This was made possible by additional manpower and vehicles contributed by the California Division of Forestry. It helped reduce a weakness apparent in previous years' aerial operations.

The spring aerial survey was augmented by two flights later in the season. One was a reconnaissance by the California Division of Forestry of parts of the Klamath and Scott River drainages for signs of insect outbreaks. The other was made in conjunction with a forest survey flight by the Station's Forest Economics Division to examine southern California and parts of the southern Coast Range. In addition to flights primarily to look for insect outbreaks, a great deal of flying done by foresters for other purposes helped contribute to knowledge of local pest problems. Even so, the total of all flights that shed light on these problems was without much doubt well below the 200 hours needed to adequately cover the State. This is a phase of the survey program that badly needs strengthening.

Figure 1. Detection reports of forest pest damage are screened by specialists at the California Forest and Range Experiment Station. A total of 361 reports were received in 1958.

To accelerate statewide disease survey and to tie in the disease results more closely to those of other resource surveys, a new sampling procedure was devised and put into operation in 1958. Random temporary plots are now being used rather than permanent plots. Each year's survey results will be cumulative for machine compilation and analyses. The stepped-up survey program together with a greater number of "detection reports" received from interested cooperators make the 1958 data more indicative of true conditions than any yet collected. The location of the 125 disease survey plots established during the year is shown in figure 2. Figures from the 1958 survey are given in Table 5 and in the text of this report for the number of plots and trees supporting the various diseases. These data are accurate for the plots and trees concerned but are of course based on a small sample. As yet they do not provide a statistically reliable measure of disease conditions throughout the State. Nevertheless, some significance can be

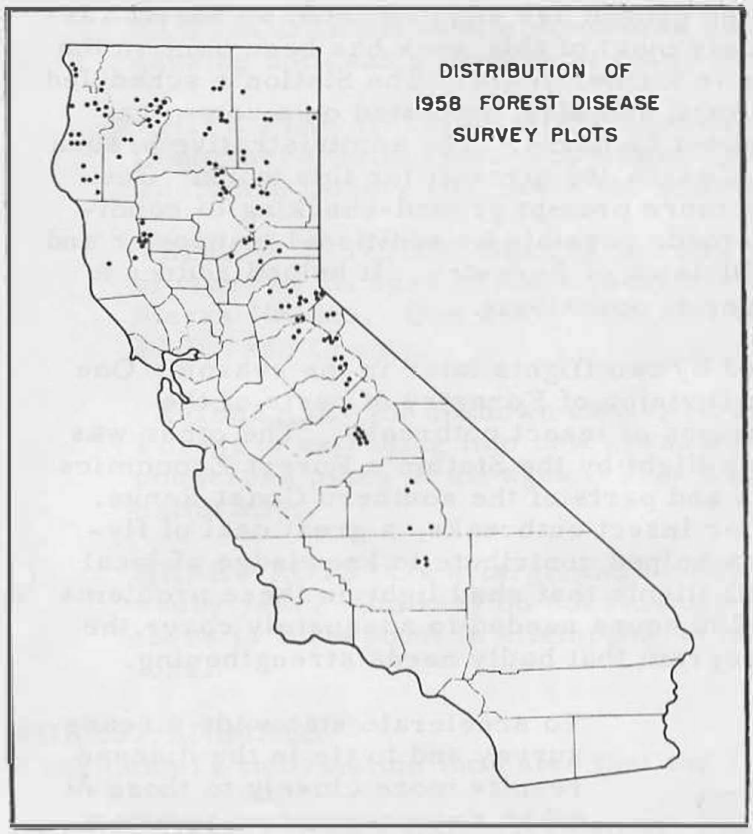


Figure 2.

attributed to the frequency with which a certain pest occurs on randomly chosen plots. For example, the prevalence of dwarf-mistletoe on red fir is evident from its occurrence on 76 of the 181 (42 percent) red fir recorded for the 125 plots.

Knowledge of current forest pest conditions was bolstered by information from several other sources besides detection and appraisal surveys. Ten timber companies turned in season-end reports on forest pests in their respective areas just in advance of the Action Council's November meeting. At year's end, an additional 33 companies reported on pest conditions and on cutting done on their respective holdings to reduce damage. Likewise, most public forestry agencies provided information to supplement the survey. These reports combined with the survey findings provide a fairly complete picture of forest pest conditions for 1958.

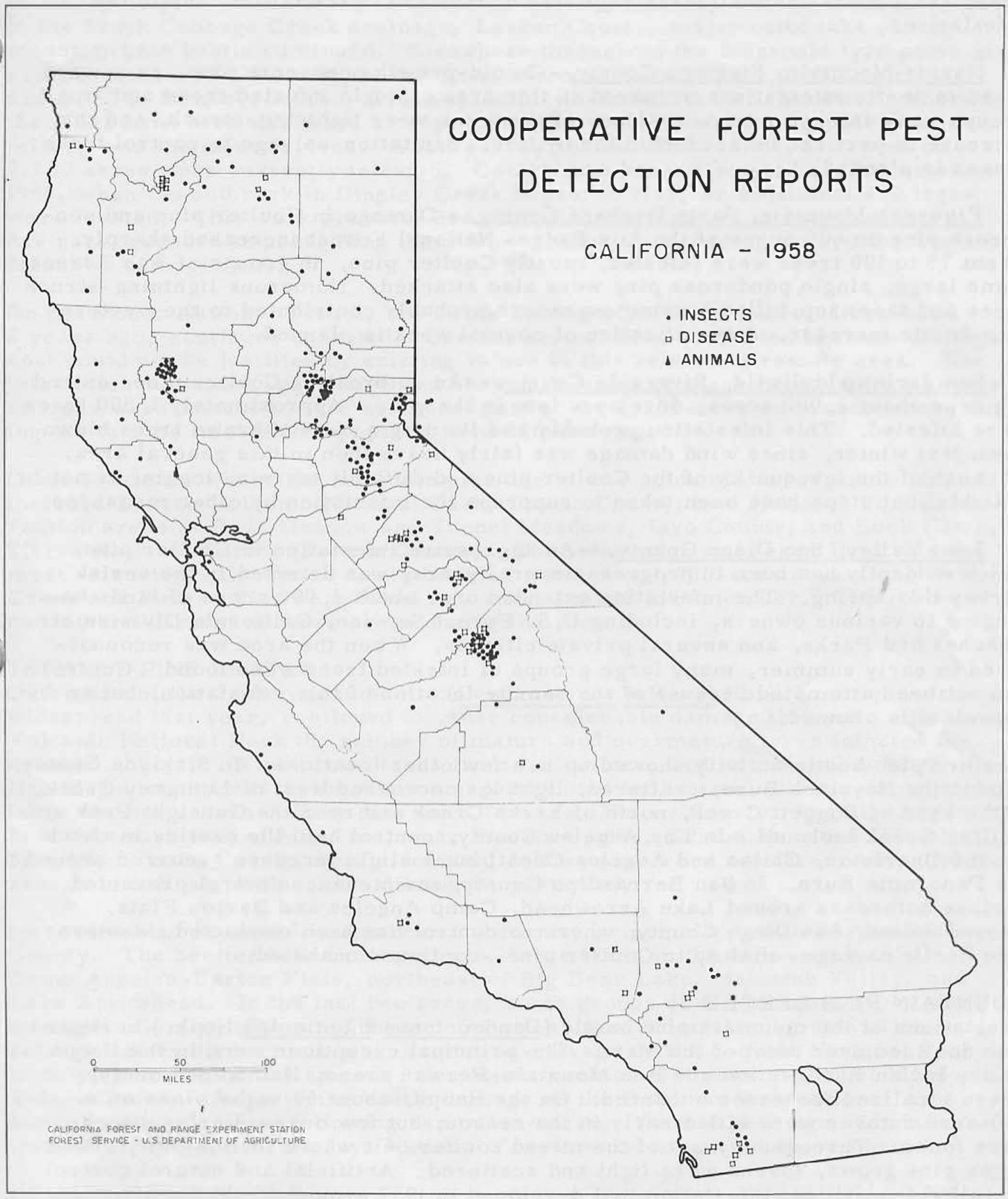
STATUS OF MAJOR FOREST INSECT PESTS DURING 1958

WESTERN PINE BEETLE

In the northern part of the State, outbreaks of the western pine beetle (Dendroctonus brevicomis Lec.) in ponderosa pine were less frequent than usual. Those that did occur were quite localized and in most cases associated with windthrown or lightning-struck trees, or other stand disturbances. Damaging infestations in Coulter pine, and to a lesser extent ponderosa, continued in southern California.

Burns were not as important a contributing factor to western pine beetle outbreaks this year as they were last. Surveys of the McGee and Haystack Burns, where sizeable infestations developed in 1957, disclosed that control measures coupled with natural factors reduced this year's infestations to low levels. They showed that 1957 overwintering broods declined in many other localities, viz. Jawbone Creek, Tuolumne County; Kidder Creek, Siskiyou County; Prewitt Ridge, Monterey County; and throughout most of the foothill pine belt in Nevada and Placer Counties. Late in 1958, however, western pine beetle infestations in the foothills showed signs of increasing. The principal known outbreaks were as follows:

1. Devil's Garden, Modoc County. --An infestation bordering upon outbreak proportions developed late in the summer in the Devil's Garden-Crowder Flat area. It occurred in old-growth ponderosa pine stands on some 7,000 acres, and presumably resulted from a buildup of beetles in numerous windthrown trees blown


COOPERATIVE FOREST PEST
DETECTION REPORTS
CALIFORNIA - 1958
• INSECTS
□ DISEASE
▲ ANIMALS
0
50
100
MILES
CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
FOREST SERVICE - U.S. DEPARTMENT OF AGRICULTURE

down last winter. Sanitation-salvage was undertaken in the fall to control the infestation.

2. Harris Mountain, Siskiyou County. --In old-growth ponderosa pine, an upward trend in beetle infestations occurred in this area. Single infested trees and small groups were fairly numerous. Many of the trees were lightning-struck, and the increase in part can be accounted for by this. Sanitation-salvage to control these losses is planned.

3. Figueroa Mountain, Santa Barbara County. --Damage in Coulter pine and ponderosa pine on 600 acres of the Los Padres National Forest increased sharply. From 75 to 100 trees were infested, mostly Coulter pine, in groups of 3 to 7 trees. Some large, single ponderosa pine were also attacked. Numerous lightning-struck trees and trees top-killed by pine engravers probably contributed to the western pine beetle increase. Intensification of control work is planned.

4. San Jacinto-Idyllwild, Riverside County. --An outbreak in Coulter pine, extending over about 2,000 acres, developed late in the year. Approximately 1,500 trees were infested. This infestation probably had its origin in windthrown trees blown down last winter, since wind damage was fairly heavy then in this general area. Because of the low quality of the Coulter pine and difficult terrain, logging is not feasible; but steps have been taken to suppress the infestation by other measures.

5. Lost Valley, San Diego County. --An aggressive infestation in Coulter pine, which evidently has been in progress several years, was detected in the aerial survey this spring. The infestation extended over about 4,000 acres of lands belonging to various owners, including U.S. Forest Service, California Division of Beaches and Parks, and several private citizens. When the area was reconnoitered in early summer, many large groups of infested trees were found. Control has not been attempted because of the remote location of this infestation, but an appraisal is planned.

Western pine beetle activity showed up in a few other locations. In Siskiyou County, around the Haystack Burn, scattered, light loss occurred west of Lumgrey Creek, at the head of Doggett Creek, north of Yreka Creek and near the Gunsight Peak and Collins Creek lookouts. In Los Angeles County, control held the beetles in check around Charleton, Chilao and Angeles Crest; but a slight increase occurred around the Panorama Burn. In San Bernardino County, maintenance control prevented serious outbreaks around Lake Arrowhead, Camp Angeles and Barton Flats. Around Julian, San Diego County, where no control has been conducted, western pine beetle damage--mainly in Coulter pine--continued unabated.

MOUNTAIN PINE BEETLE

Infestations of the mountain pine beetle (Dendroctonus monticolae Hopk.) in sugar pine declined over most of the State. The principal exceptions were in the Hoopa Valley Indian Reservation and Bee Mountain-Pecwan areas, Humboldt County, where localized increases occurred. On the Hoopa, about 50 sugar pines on a 400-acre cutover were killed early in the season, but few overwintering attacks were found. Throughout most of the mixed conifer belt where the majority of the sugar pine grows, losses were light and scattered. Artificial and natural control curtailed the critical infestation that developed in 1957 around the McGee Burn, Tulare and Fresno Counties. Near Lake Arrowhead and in the San Jacinto-Idyllwild area in southern California, maintenance control helped keep losses confined to a few, scattered trees.

In lodgepole pine stands along Dingley and Delaney Creeks, Tuolumne County, and in the Skunk Cabbage Creek drainage, Lassen County, major outbreaks of the mountain pine beetle continued. Elsewhere throughout the lodgepole type some increases occurred. Maturity of the stand has contributed to the problem in most areas. The Dingley-Delaney Creek epidemic in Yosemite National Park, where the trees have been weakened by repeated defoliation from the lodgepole needle miner, was the most serious. A fall survey showed that some 2,086 trees on 2,680 acres were currently infested. Control has been attempted each year since 1955, when the outbreak in Dingley Creek began; in 1958, an additional 450 trees were treated. This work probably has slowed the advance of the beetles, but it has not succeeded in preventing them from gradually spreading toward the Tuolumne Meadows campground.

On the Modoc National Forest, the Skunk Cabbage Creek epidemic, discovered 2 years ago, continued unabated. Control has not been attempted because the high cost could not be justified by existing values in this relatively remote area. The infestation remained aggressive and showed no signs of slackening. Large groups of trees were attacked in the northeast part of the 2,200-acre outbreak, where during the fall the infestation appeared to be intensifying.

Other localities where the mountain pine beetle was epidemic in lodgepole stands included Lassen Volcanic National Park, Shasta County; Inyo National Forest recreation areas at Reds Meadow and Tunnel Meadows, Inyo County; and Buck Camp, Sierra National Forest (Fresno County). The infestation in Lassen Park was the most extensive. Groups of newly infested trees on a 1,000-acre area along Hat Creek and Badger Flat were found in a survey made in September. Control was undertaken in most of these areas during the year.

JEFFREY PINE BEETLE

Outbreaks of the Jeffrey pine beetle (Dendroctonus jeffreyi Hopk.), which were widespread last year, continued to cause considerable damage this year. In Lassen Volcanic National Park the number of mature and overmature trees infested increased sharply. Windthrown trees from last winter, and an unusual number of lightning-struck trees in the summer, contributed to the rise. Beetle damage to large second-growth Jeffrey pine near Truckee, Placer County, was also reported. In stands northeast of Mt. Tom, near Florence Lake, Edison Dam and Mono Hot Springs, Fresno County, beetle-infested Jeffrey pine were scattered, but numerous enough to indicate an increase during the past year.

Increases also occurred in southern California, principally in San Bernardino County. The beetles killed many single, large trees in the following localities: Camp Angeles-Barton Flats, northeast of Big Bear Lake, Holcomb Valley, and Lake Arrowhead. In the last two areas, some groups of 4-5 or more trees were infested. Control of most of these infestations was undertaken by sanitation-salvage and by direct methods. Sanitation-salvage on the Sequoia National Forest is helping to control the serious infestation reported last year in Cannel Meadows, Tulare County. Jeffrey pine beetle damage on the Deadman Recreational Area, Mono County, declined following sanitation-salvage there a year ago, but infestations in other parts of the Inyo National Forest were somewhat above normal.

DOUGLAS-FIR BEETLE

Infestations of the Douglas-fir beetle (Dendroctonus pseudotsugae Hopk.) increased very little above the generally low level of the past two years throughout most of northwestern California. Increases that were anticipated from reports late in 1957 did not materialize. The only known exceptions were Grider Creek, Siskiyou

County, and the Hoopa Valley Indian Reservation, Humboldt County. The Grider Creek outbreak, extending over some 5,100 acres of the Klamath National Forest, has been in progress since 1954. Logging is scheduled as soon as this area can be reached. At Hoopa losses were somewhat higher than normal, and some groups of 8-10 trees were infested. In the Pine Creek drainage adjacent to a burn, beetles killed several hundred trees in 1957, but the outbreak did not continue in 1958.

FIR ENGRAVER

Outbreaks of the fir engraver (Scolytus ventralis Lec.) in white and red fir again were quite localized, and losses in total very moderate. Small centers of infestation occurred in the South Warner Mountains, Modoc County; in stands previously heavily defoliated by the Douglas-fir tussock moth in Calaveras and Tuolumne Counties; near Burney, Shasta County; and over a 2,000-acre area around Lake Tahoe in Placer and Eldorado Counties. Losses in white fir on Sterling Mountain, Siskiyou County, were attributed to this insect, but the report was not confirmed.

PINE ENGRAVERS

Damage by the California five-spined engraver (Ips confusus (Lec.)) and the Oregon pine engraver (I. oregoni (Eichh.)) continued at the same generally low level as in 1957 during the early part of this year. The only exception was in southern California where outbreaks were recurrent. In the last quarter of 1958, following one of the driest and warmest fall periods in the State's history, pine engravers became more destructive to ponderosa and Jeffrey pine in northern as well as southern California. In addition, two normally minor species, the California four-spined engraver (I. plastographus Lec.) and the Monterey pine engraver (I. radiatae Hopk.) caused noticeable damage in Monterey pine stands along the coast.

One of the most severe outbreaks showed up in December, near Middletown, Lake County, in second-growth ponderosa pine. In several small centers aggregating 2,300 acres, the California five-spined engraver killed about 1,000 trees. Similar damage was reported on about 1,000 acres of the Mendocino National Forest around Upper Lake, Mendocino County. Extensive tree-killing by this species is unusual and attests to the aggressiveness of the infestation; normally it is a top killer. More typical small infestations of this engraver, in combination with the western pine beetle, developed following right-of-way clearing in Sacramento Canyon, Shasta County and around Bass Lake, Madera County. In southern California, pine engravers caused unusually heavy top-killing, and occasional tree mortality of Jeffrey, ponderosa and Coulter pines in the following localities: Chilao and Barley Flats, Los Angeles County; Figueroa Mountain, Santa Barbara County; Indian Canyo San Diego County; and of pinyon pine in Mill Potrero, Kern County.

Monterey pine trees, killed principally by the California four-spined engraver, were scattered through the coastal area from Cambria, San Luis Obispo County to Watsonville, Santa Cruz County. Logging slash, coupled with the stagnated condition of many of the trees, contributed to the outbreak.

OTHER BARK BEETLES

Damage from the red turpentine beetle (Dendroctonus valens Lec.) was greatly reduced in 1958 over most of the State. The greatest reductions were around the McGee and Haystack Burns. In southern California, light to heavy attacks by this beetle generally occurred on trees attacked by other bark beetles, but occasional trees were attacked by the red turpentine beetle alone.

Near Requa, Del Norte County, an unusual infestation of Sitka spruce beetle (Dendroctonus obesus (Mann.)) developed in a 20-acre roadside stand. Mature and overmature trees were attacked and killed. This is the first record of the insect in California since 1914.

Numerous groups of young Douglas-fir on cutover lands in Humboldt and Mendocino Counties were heavily infested late in the year by the Douglas-fir engraver (Scolytus unispinosus Lec.). Infestations were concentrated around Garberville and Miranda, and in scattered localities southward. Most of the attacked trees were in or near logging operations; they ranged from sapling size up to 24 inches in diameter. The infestations were the most aggressive in many years, and are probably related to dry weather during the fall months.

CALIFORNIA FLATHEADED BORER

Infestations of the California flatheaded borer (Melanophila californica Van D.) were about normal over most of the State except in southern California. There the insect was very destructive to Jeffrey pine in many localities, particularly where no control has been done.

The serious infestations on Cleveland National Forest and intermingled private lands at Mt. Laguna and Corte Madera, San Diego County, have been checked by direct control. Sanitation-salvage in the following localities has reduced the damage, and supplemental direct control was applied or is planned to keep the borers in check: Big Pines, Los Angeles County, on Angeles National Forest and adjacent private lands; Mt. Pinos and Grade Valley, Ventura County, on the Los Padres National Forest. In some localities, where no sanitation-salvage has been done, losses continued in spite of direct control, viz. San Jacinto, Riverside County; Mill Potrero, Kern County; Frazier Mt., Ventura County; Charleton-Chilao-Angeles Crest, Los Angeles County. In several of these areas sanitation-salvage is planned. At Alamo Mountain, Ventura County, on the Los Padres National Forest, where flatheaded borers have been very destructive for several years, sanitation-salvage was started. This method was also used to help reduce losses around Big Bear Lake, San Bernardino County. At Wrightwood, also in San Bernardino County, flatheaded borers associated with pine engravers caused heavy losses in young Jeffrey pine. A zone of infestation was established and control is planned.

LODGEPOLE NEEDLE MINER

A long-standing infestation of the lodgepole needle miner (Recurvaria milleri Busck), in progress since 1947, continued to ravage lodgepole pine forests in Yosemite National Park. This outbreak, located in the headwaters of the Tuolumne River, Tuolumne County and Merced River, Mariposa County, covered 50,000 acres. Lodgepole over most of this area was heavily defoliated. Some tree mortality resulted from defoliation alone, and much more from mountain pine beetle in combination with the needle miner. To the south, in Sequoia-Kings Canyon National Park, needle miner infestations persisted in two localities. One was a 700-800-acre outbreak on Woods Creek, Fresno County, where defoliation was very heavy. The other was an infestation of medium intensity covering about 500 acres of the Kern-Kaweah River drainage, Tulare County.

North of Yosemite, on the Stanislaus National Forest, a survey confirmed for the first time the existence of an infestation of the needle miner in the Emigrant Basin Wild Area, Tuolumne County. Defoliation over the 1,500-acre outbreak ranged from light to heavy, but very little tree-killing occurred. East of Yosemite, at

Sentinel Meadows, Mono County, defoliation of lodgepole by needle miners continued over a fairly large area. The insect in this particular outbreak reaches the moth stage in even-numbered years, as opposed to the one in Yosemite which matures in odd-numbered years. Whether both insects are one species is not known.

Spraying to control the lodgepole needle miner around Tuolumne Meadows was continued in Yosemite National Park. A mist blower was used to spray malathion along roads and around campgrounds. Spraying this insecticide by helicopter, at a dose of 2 lbs. in 20 gallons of fuel oil per acre, was again tried in the spring and fall months. Control in the spring, when the needle miners were small and well concealed inside the needles, averaged only 45 percent. In the fall, when the larvae were much larger and less well protected, control averaged 76 percent. This is about the same control achieved last year against the moths and newly hatched larvae.

OTHER NEEDLE MINERS

The Jeffrey pine needle miner (Recurvaria sp.), an insect that sometimes defoliates Jeffrey pine severely, was active in two localities. Around Grant Grove, Tulare County, in Sequoia-Kings Canyon National Park, it caused light damage. In Mono County, some trees in the Deadman Recreational Area were heavily defoliated, but the damage was spotty.

Minor infestations of the pine needle-sheath miner (Zelleria haimbachi Busck) were found in two localities. One was on the Modoc National Forest's ponderosa and Jeffrey pine plantings on Sugar Hill, Modoc County; the other in various species of hard pines and their hybrids at the Institute of Forest Genetics, Placerville. In both places defoliation was very light.

Surveys of the California Bureau of Entomology revealed no further signs of the spruce needle miner (Taniva albolineana (Kearf.)) this year. In 1957 this introduced pest was discovered for the first time on ornamental spruce around Alturas, Modoc County, and action was taken by the Bureau to eradicate it.

DOUGLAS-FIR TUSSOCK MOTH

The Douglas-fir tussock moth (Hemerocampa pseudotsugata McD.) remained quiescent over most of the area in Tuolumne County where it was in outbreak 2 years ago. Defoliation in white fir stands was very light, except in one 500-acre stand along a ridge between Little Reynolds and Bourland Creeks. White fir mortality in stands heavily defoliated in 1956 has continued to mount, mostly due to attacks of the roundheaded fir borer (Tetropium abietis Fall) and the fir engraver in weakened trees. On study plots the volume dead from all causes since 1956 more than doubled this year. The total to date, 10,069 board-feet per acre, exceeds 18 percent of the stand. White fir mortality in the moderately and lightly defoliated stands has been negligible.

OTHER DEFOLIATORS

The white-fir sawfly (Neodiprion abietis (Harr.) complex) remained at a very low level in 1958. No damage due to this insect was reported.

Pine sawflies (Neodiprion spp.) were less numerous this year than last in two localities where infestations have persisted. In one small ponderosa and Jeffrey pine plantation near Willits, Mendocino County, defoliation was markedly reduced. Plantations of these same species near Mt. Shasta, Siskiyou County, were only lightly defoliated.

The spruce budworm (Choristoneura fumiferana (Clem.)) infestation, which has persisted for years in the Warner Mountains, Modoc County, increased both in area and intensity. For the first time, the budworm was found south of Cedar Pass in the South Warners, where on the east slopes of Horse Mountain it defoliated several hundred acres of white fir. Defoliation in the North Warners was much heavier than usual.

The pandora moth (Coloradia pandora Blake) in pine stands on the Laguna Mountains, San Diego County, remained at a low level. Natural controls kept the abundant egg population of 1957 from producing enough larvae to cause damage.

Alder along some stream courses in San Bernardino County was heavily defoliated by the alder flea beetle (Altica ambiens (Lec.)).

PINE REPRODUCTION WEEVIL

Damage by the pine reproduction weevil (Cylindrocopturus eatoni Buch.) from attacks begun in 1957, was localized but quite severe in some pine plantations in Tuolumne and Eldorado Counties. In a 10-acre hybrid planting at Tony Gulch on the Eldorado National Forest, weevils killed 9 percent of the Jeffrey x Coulter pine, 13 percent of the Apache x ponderosa, and 25 percent of the Arizona x ponderosa. In five pine plantations with an aggregate area of about 1,100 acres on the Spinning Wheel Burn, Tuolumne County, Stanislaus National Forest, weevil attacks started in 1958 caused serious tree mortality. Weevils also damaged a 500-acre planting on the Wrights Creek Burn, also on the Stanislaus. The Tony Gulch infestation and 265 acres of the Spinning Wheel plantation infested in 1957, were sprayed by helicopter with DDT during June. Control was not satisfactory, and respraying is planned.

Some hybrid pines show real promise for planting in areas where weevil damage can be expected. Ten years field trials with the backcross hybrid Jeffrey x (Jeffrey x Coulter) pine have shown this hybrid to be very resistant to the pine reproduction weevil.

CONE AND SEED INSECTS

Cone and seed insects severely damaged this year's coniferous seed crop, and though most tree species produced far more cones than last year the amount of good seed was small. The ponderosa and Jeffrey pine cone crop was fair to moderate, but about 80 percent of the cones were infested by pine seed moths. Hedulia injectiva Heinrich and, to a lesser extent, Laspeyresia piperana (Kearf.), were the most destructive to Jeffrey pine cones; and L. miscitata Heinrich the most destructive to ponderosa. Some seed, even in moth-infested cones, escaped destruction; but the amount of good seed was reduced 18 to 20 percent by the ponderosa-pine cone beetle (Conophthorus ponderosae Hopk.). Sugar pine fared somewhat better. About half of the cone crop was destroyed by the sugar pine cone beetle (C. lambertianae Hopk.), but generally there were enough cones left to provide a better than average supply of seed.

The Douglas-fir cone crop, though fairly good throughout the Douglas-fir belt, was hard hit by insects. Over 73 percent of the cones were infested with cone moths, principally the Douglas-fir cone moth (Barbara colfaxiana (Kearf.)) and the fir cone worm (Dioryctria abietella (D. & S.)). Of the seed that escaped these insects, 7 percent were destroyed by the Douglas-fir seed chalcid (Megastigmus spermotrophus Wachtl.). Gall midges (Contarinia sp. near oregonensis Foote) accounted for additional seed losses. Other midges (Rubsaamenia sp.) were abundant but the amount

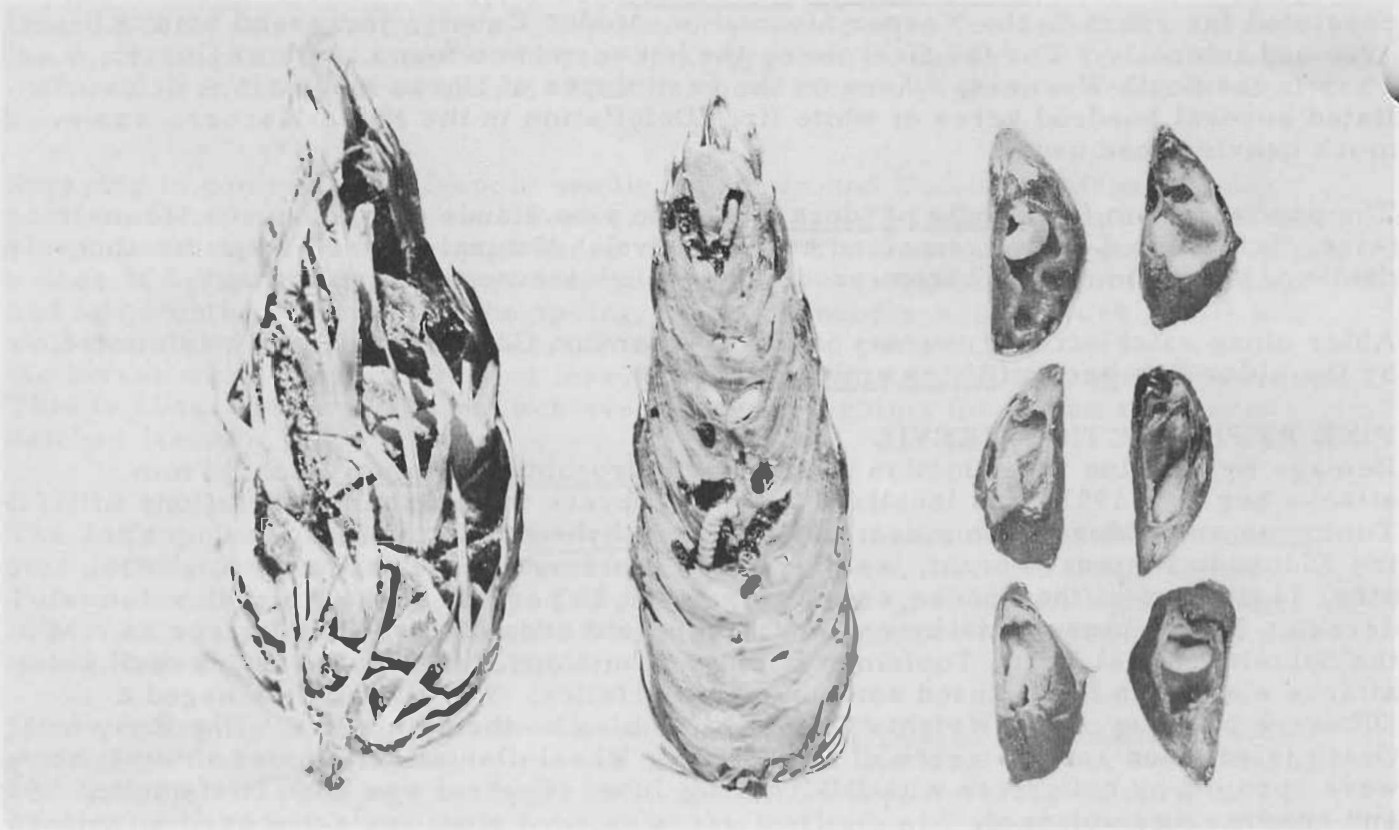


Figure 3. Cone moths (in Douglas-fir cones, left and center) and seed chalcids (in white fir seed, right) destroyed much of the coniferous seed crop in 1958.

of damage they caused was not determined. Some stands were less severely affected by insects than others, but generally damage was so great that seed collecting was not profitable in many areas.

BROWSE INSECTS

Browse plants were damaged by a variety of insects, especially in the northeastern part of the State. Studies which the Station has been conducting on bitterbrush, one of the important browse species, have helped focus attention on the destructiveness of insects attacking these plants. One of the most injurious was the Great Basin tent caterpillar (Malacosoma fragile (Stretch)). This pest again defoliated severely an extensive area of manzanita, whitethorn, tobacco brush and bitter cherry between Westwood, Lassen County and Chester, Plumas County. Considerable brush mortality resulted. Tent caterpillar damage to bitterbrush was common throughout most of the eastside game ranges. The ceanothus silk moth (Hyalophora euryalus Bdv.) was also a frequent feeder on this plant, from Inyo County northward to the Oregon border, but it did not cause severe damage. Two serious pests of bitterbrush seed found in the same area were the green plant bug (Chlorochroa uhleri Stal) and the conchuela (C. ligata (Say)).

The fall webworm (Hyphantria cunea (Drury)) partly defoliated choke cherry over a wide area. This host and associated brush species near McCloud, Siskiyou County, were also damaged by the ugly-nest caterpillar (Archips cerasivorana (Fitch)). In parts of the Salmon Mountains, on the border of Humboldt and Siskiyou

Counties, the California tortoise-shell butterfly (Nymphalis californica (Bdv.)) was extremely abundant. On Orleans Mountain, some areas of ceanothus were stripped by the butterfly larvae.

OTHER DESTRUCTIVE INSECTS

Many lesser forest insect pests were observed or reported during the year. The lodgepole terminal weevil (Pissodes terminalis Hopp.) was very abundant throughout much of the range of its host. This pest is one of the principal causes of forked or multiple tops in lodgepole stands. Heavy infestations occurred from Old Station, Shasta County, south along the Sierra to Tunnel Meadows, Inyo County. A related insect, the Yosemite bark weevil (Pissodes yosemite Hopk.) killed about 10 percent of the trees in an 8-acre planting of ponderosa and Jeffrey pine near Fish Camp, Mariposa County.

Infestations of twig beetles (Pityophthorus spp.) were common as they were last year. Tip-killing of mature ponderosa, Jeffrey and sugar pine with which these beetles are generally associated, was quite prevalent in many parts of the State. Twig damage attributed to Pityophthorus carmeli Sw. was heavy in Monterey pine around Carmel, Monterey County.

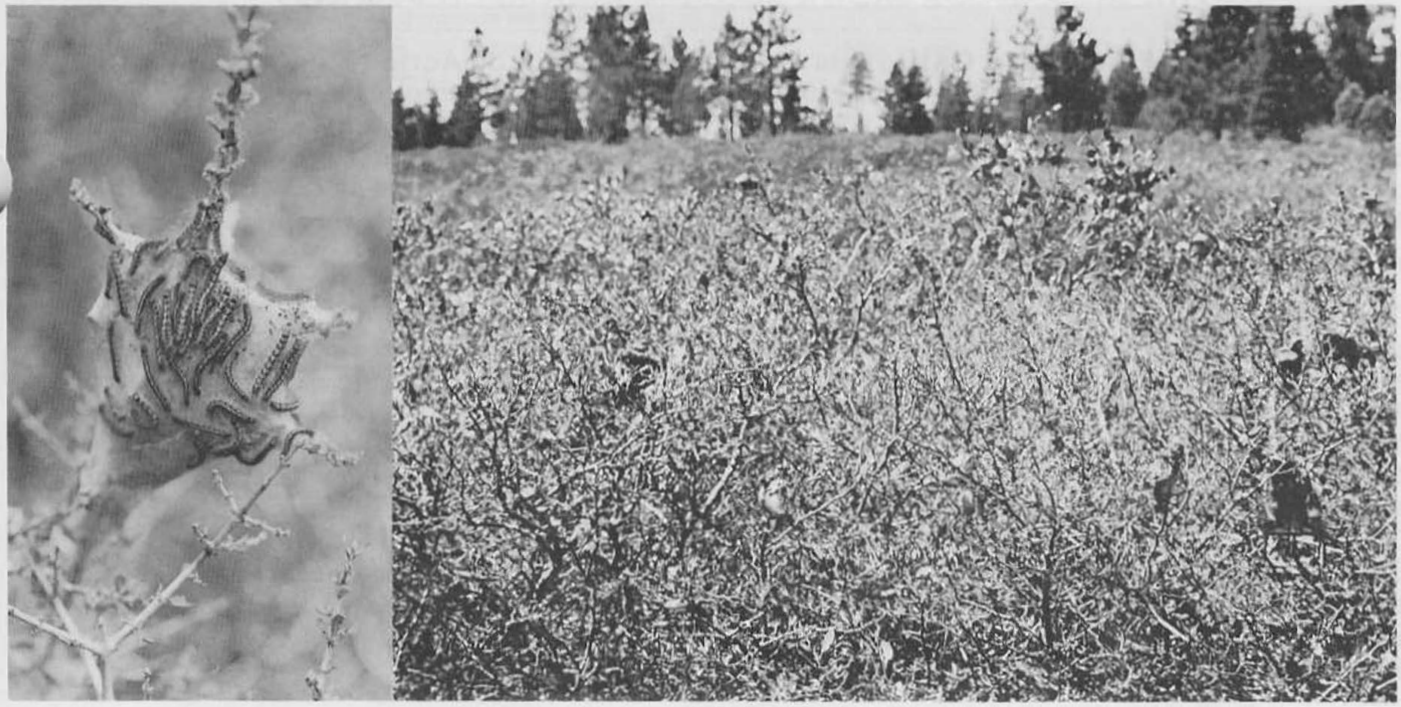


Figure 4. The Great Basin tent caterpillar, a common defoliator of browse plants on eastside game ranges.

Ponderosa pine reproduction in the mixed conifer type, from Mariposa County northward to Butte County, was damaged by tip moths (presumably Rhyacionia zozana (Kearf.)). In natural stands on the Blodget Forest, Eldorado County, and elsewhere these insects destroyed many of the lateral and terminal buds. Similar injury occurred to planted trees near Woodleaf, Butte County. Twig damage due to resin midges (Retinodiplosis inopis (O.S.)) continued in the ponderosa and Jeffrey pine plantings at Mt. Shasta, Siskiyou County. Plantations at Sugar Hill, Modoc County and Burney Springs, Shasta County were lightly infested. Over most of its range, however, the midge was not particularly abundant this year.

The black pine-leaf scale (Aspidiotus californicus Colm.) caused severe yellowing of foliage on mature sugar pine near Mt. Shasta, Siskiyou County and in Adar Grove, Sequoia-Kings Canyon National Park, Fresno County. The injury is the same as that discovered last year on the Trinity and Eldorado National Forests. In northwestern California, surveys to detect the balsam woolly aphid (Chermes piceae (Ratz.) were conducted late in the summer. However, no signs of the insect were found in this part of the State. Aphids tentatively identified as the balsam woolly aphid were found on a Nordmann fir tree (Abies nordmanniana) on the University of California campus, Berkeley. Considering that the balsam woolly aphid was collected 30 years ago in Golden Gate Park, San Francisco, and Hillsborough, this record is not surprising.

THE INSECT CONTROL PROGRAM ENDORSED FOR 1959

The annual meeting of the California Forest Pest Control Action Council held at Sacramento, California, November 6, was attended by 47 representatives of federal and state agencies, and the timber industry. The Council reviewed the status of forest pests within the State, discussed progress on pest control, and considered proposed control projects for 1959. A summary of current forest insect infestations requiring control, together with the Council's recommendations for action is presented in table 4.

Timber managers and owners reported increased emphasis in 1958 by industry and the Federal Government in controlling bark beetles through the salvage of infested trees. On most of the major private holdings in the pine belt aggressive steps to log infested as well as susceptible trees are being taken. The U.S. Forest Service likewise has continued to expand its active program of logging infested trees so that on most major timber-producing national forests in California cutting designed to reduce losses due to insects is underway. In the northern California pine region, 32 salvage loggers reported 53 million board-feet logged in 1958. Of this total, 34 million consisted of trees currently insect-infested. Logging infested trees, together with logging those that are insect susceptible, which has long been standard practice in ponderosa and Jeffrey pine stands in California, has resulted in recovering some of the volume of timber killed by insects.

The Council strongly endorsed the practice of logging infested trees as a control measure against bark beetles. At the same time, it recognized that other supplemental methods are at times necessary, and that logging is not the answer for controlling defoliating insects and insects that attack unmerchantable timber. Action to control the lodgepole needle miner in Yosemite National Park through the use of aerial sprays was endorsed. Certain members of the Council questioned the wisdom of controlling the mountain pine beetle in lodgepole pine seriously defoliated by the needle miner until a satisfactory method of control for the latter insect has been developed.

ACCOMPLISHMENTS OF RECENT CONTROL ACTION

Forest insect control accomplishments by the major private, state and federal agencies in California in 1958 are summarized in the following tables.

TABLE 1.--VOLUME OF INSECT KILLED OR SUSCEPTIBLE TREES REMOVED BY PRIVATE LOGGING COMPANIES

Company	No. Acres	Infested Volume (M.B.M.)	Susceptible Volume (M.B.M.)	Tree Species
Associated Lumber & Box	--	1,500	1,500	PP, SP, WF, RF
Bear Valley Mutual Water	10	5	5	PP
Big Bear	940	1,000	1,100	PP, JP, WF
Blagen	622	50	600	PP, SP
Crane Mills	2,700	68	19,000	PP, SP, DF, WF, IC
Fruit Growers Supply	5,237	800	1,100	IC, PP, DF, SP, WF
Hatler	200	30	200	PP
Hearst Wyntoon Tree Farm	2,139	1,000	5,000	PP, SP, DF, WF
Inman Paulsen	--	45	50	PP, SP
International Paper	1,413	2,500	3,500	PP, SP, WF, RF
McCloud River	6,973	3,000	6,695	PP, SP, DF, WF
Michigan-California	1,000	50	500	PP, JP, SP
Mt. Whitney	406	550	--	PP, SP
Nettleton Forest Products	2,660	15	10	PP, SP, WF, DF, IC
Pickering	1,336	350	17,500	SP, PP, WF
Redding Pine Mills	1,350	20	20	PP, SP
Scott	10,210	4,646	1,496	SP, PP, DF, WF, IC
Setzer Forest Products	1,000	879	3,198	PP
Ralph L. Smith	12,700	143	956	PP, DF
Soper-Wheeler	5,900	250	11,000	SP, PP, WF, DF
Southern California Edison	900	50	--	SP
Southern Pacific	10,000	2,000	65,000	SP, PP, DF, WF
Stockton Box	2,030	62	--	PP, SP, WF, DF
Tahoe Timber	--	262	--	PP, JP
Van Vleet Wood Products	160	100	2,000	SP, PP
Total	69,886	19,375	139,430	

This is not intended to represent the total volume of infested or susceptible timber salvaged, but includes only those companies reporting their annual cut of insect susceptible or infested trees.

TABLE 2.--INSECT CONTROL PROJECTS ACCOMPLISHED ON STATE AND PRIVATE LAND IN 1958 UNDER THE STATE FOREST INSECT CONTROL LAW IN COOPERATION WITH TIMBERLAND OWNERS

Name and Location	No. Acres	No. Trees	Insect	Host	Cost	Control Method
Administrative Project						
Siskiyou Co.	25	100	Db	PP	$ 534	Fell, peel-burn
*Haystack						
Siskiyou Co.	1,200	70	Db	PP	634	Toxic spray
*Sequoia-Kings Canyon						
Fresno and Tulare Cos.	2,900	229	Dm, Db	SP, PP	1,033	Toxic spray
Cuyamaca State Park						
San Diego Co.	10,000	60	Mc	JP, CP	1,750	Toxic spray
Corte Madera						
San Diego Co.	3,120	11	Db	PP	222	Toxic spray
*San Bernardino						
Arrowhead-Crestline	16,172	474	Db, Dm, DJ Mc, Ips	PP, SP JP, CP	12,023	Toxic spray
San Bernardino Co.						
*San Jacinto						
Riverside Co.	9,187	817	Db, Mc, Ips	PP, JP CP, SP	11,799	Toxic spray
Total	42,604	1,761			$27,995	

*Cooperative project jointly financed by the private owners and the State and Federal Government.

TABLE 3.--INSECT CONTROL PERFORMED BY FEDERAL AGENCIES DURING 1958

Location	No. Acres	No. Trees	Insects	Host	Control Method	Cost
			NATIONAL PARKS			
Lassen	3,180	86	DJ, Dm	JP, SP, LP	Toxic spray, peel-burn	$ 2,790
Sequoia-Kings Canyon	7,680	86	Db, Dm, DJ	SP, PP, JP	Toxic spray	12,310
Yosemite	60,785	1,061	Db, Dm, DJ, Sv, Rm	PP, JP, SP, LP, WF	Toxic spray, peel-burn, aerial spray	
	71,645	1,233				$72,775
			NATIONAL FORESTS			
Angeles	10,400	134	Db, Dm, Mc, Ips	PP, JP, CP	Toxic spray	2,200
Cleveland	1,200	576	Mc, Ips	JP, CP	Toxic spray	7,210
Eldorado	7,050	76	Db, Ce	PP, Cytrids	Toxic spray aerial spray	991
Inyo	900	82	Dm	LP	Toxic spray	1,892
Klamath	1,300	443	Db, Dm	PP, SP	Fell-burn	7,100
Lassen	30,590	2,872	Db	PP	Salvage infested trees	3,600
Los Padres	7,800	2,110	Mc, Ips	JP, PP, CP	Toxic spray	17,544
Mendocino	3,540	361	Db, Dm, Ips	PP, SP	Salvage infested trees	2,406
San Bernardino	44,434	874	Db, Dm, Ips, Mc	PP, SP, JP, CP	Toxic spray	30,069
Sequoia	6,400	381	Dm, Db	PP, SP, JP	Toxic spray	15,317
Sierra	18,000	65	Db, Dm	PP, SP	Toxic spray	1,100
Stanislaus	265	Plantation	Ce	PP	Aerial spray	1,275
	131,879	7,974				$90,704

Key to Abbreviations Used:

Insects				Host Trees			
Db - Western pine beetle	Ips - Pine engravers			PP - Ponderosa pine	CP - Coulter pine		
Dm - Mountain pine beetle	Mc - California flatheaded borer			SP - Sugar pine	WF - White fir		
DJ - Jeffrey pine beetle	Sv - Fir engraver			LP - Lodgepole pine	DF - Douglas-fir		
Rm - Lodgepole needle miner	Ce - Pine reproduction weevil			JP - Jeffrey pine	IC - Incense-cedar		
					RF - Red fir		

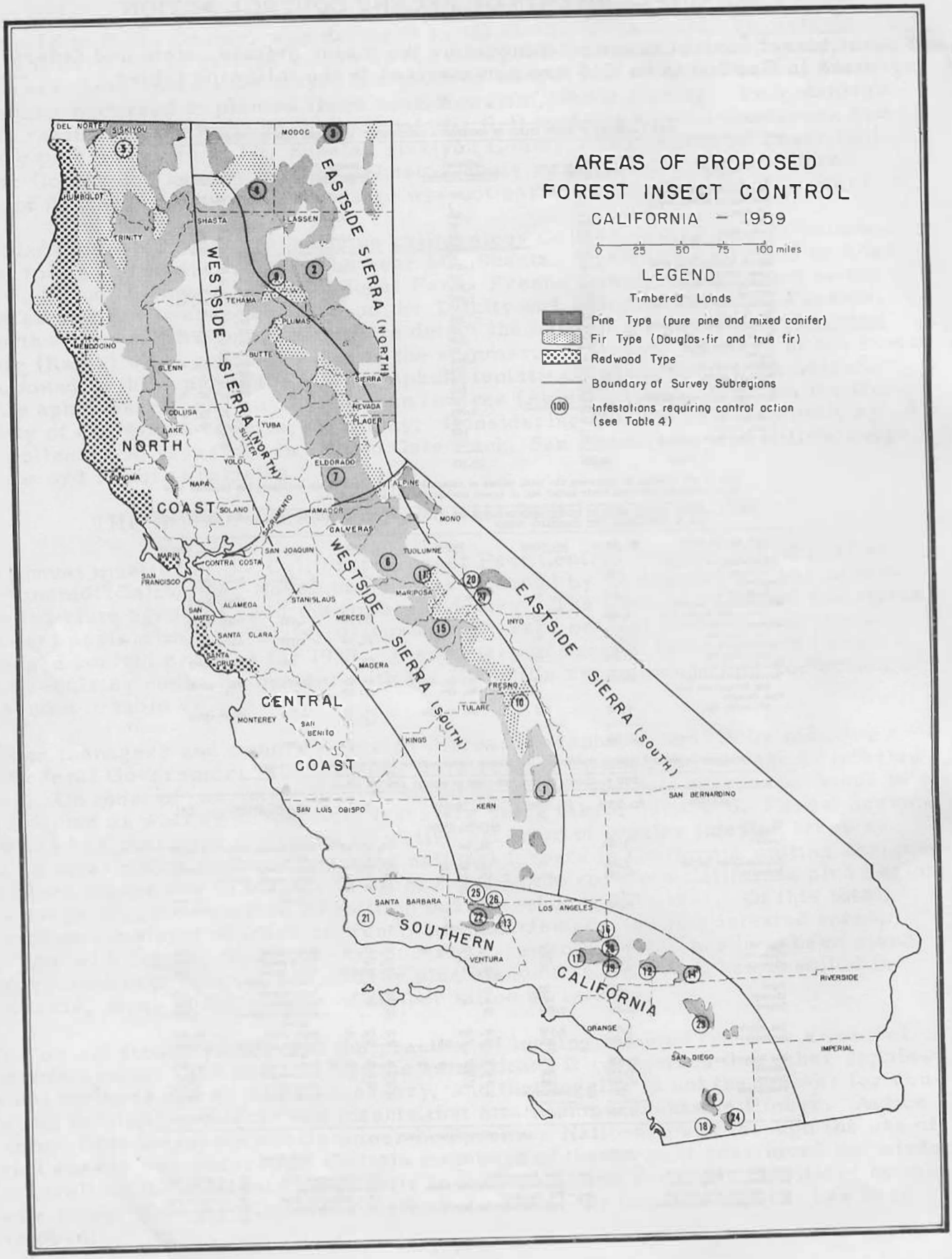

AREAS OF PROPOSED
FOREST INSECT CONTROL
CALIFORNIA – 1959
0 25 50 75 100 miles
LEGEND
Timbered Lands
Pine Type (pure pine and mixed conifer)
Fir Type (Douglas-fir and true fir)
Redwood Type
Boundary of Survey Subregions
(100) Infestations requiring control action (see Table 4)
NORTH COAST
CENTRAL COAST
SOUTHERN CALIFORNIA
WESTSIDE SIERRA (NORTH)
EASTSIDE SIERRA (NORTH)
WESTSIDE SIERRA (SOUTH)
EASTSIDE SIERRA (SOUTH)
DEL NORTE
SISKIYOU
MODOC
HUMBOLDT
SHASTA
LASSEN
TRINITY
TEHAMA
PLUMAS
MENDOCINO
BUTTE
GLENN
SIERRA
COLUSA
NEVADA
PLACER
LAKE
YUBA
SUTTER
YOLO
ELDORADO
SONOMA
NAPA
ALPINE
SOLANO
AMADOR
MONO
CALVERAS
MARIN
SAN JOAQUIN
TUOLUMNE
CONTRA COSTA
SAN FRANCISCO
MARIPOSA
ALAMEDA
STANISLAUS
INYO
SAN MATEO
MERCED
SANTA CLARA
SANTA CRUZ
MADERA
FRESNO
MONTEREY
SAN BENITO
TULARE
KINGS
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
LOS ANGELES
VENTURA
RIVERSIDE
ORANGE
SAN DIEGO
IMPERIAL

TABLE 4.—CURRENT FOREST INSECT INFESTATION AREAS REQUIRING ACTION

	PROJECT AREA	LOCATION	INFESTED ACREAGE	INSECT SPECIES CAUSING LOSS	HOST TREES KILLED	RECOMMENDED ACTION
				COMMERCIAL TIMBERLANDS		
(1)	Cannel Meadows	Tulare Co.	105,000	Jeffrey pine beetle Mountain pine beetle Fir engraver	Jeffrey pine Lodgepole pine White & red fir	Sanitation-salvage
(2)	Dogard	Lassen Co.	19,030	Western pine beetle	Ponderosa pine	Salvage infested trees
(3)	Devils Garden	Modoc Co.	7,000	Western pine beetle	Ponderosa pine	Sanitation-salvage
(4)	Harris Mt.	Siskiyou Co.	3,000	Western pine beetle	Ponderosa pine	Sanitation-salvage
(5)	Grider Creek	Siskiyou Co.	5,100	Douglas-fir beetle	Douglas-fir	Salvage infested trees
(6)	Stanislaus NF	Tuolumne Co.	1,600	Pine reproduction weevil	Ponderosa, Jeffrey pine	DDT aerial spray
				EXPERIMENTAL AREAS		
(7)	Institute of Forest Genetics	Eldorado Co.	500	Western pine beetle	Ponderosa pine	Maintenance control, spray with toxic oil
				Pine engravers Needle-sheath miner	Pine hybrids	
				STATE AND NATIONAL PARKS		
(8)	Cuyamaca Rancho	San Diego Co.	8,000	California flatheaded borer	Jeffrey pine	Maintenance control, spray with toxic oil
(9)	Lassen Volcanic National Park	Shasta and Lassen Cos.	3,000	Jeffrey pine beetle Western pine beetle Mountain pine beetle	Jeffrey pine Ponderosa pine Lodgepole pine	Maintenance control, spray with toxic oil
(10)	Sequoia-Kings Canyon National Parks	Fresno and Tulare Cos.	8,500	Western pine beetle Mountain pine beetle	Ponderosa pine Sugar pine	Maintenance control, fell-peel-burn, or spray with toxic oil
(11)	Yosemite National Park	Mariposa and Tuolumne Cos.	57,700	Western pine beetle Mountain pine beetle	Ponderosa pine Sugar pine	Maintenance control, spray with oil or fell-peel-burn
			50,000	Mountain pine beetle Lodgepole needle miner	Lodgepole pine Lodgepole pine	Toxic spray Aerial spray with malathion
				FOREST RECREATION AREAS		
(12)	Arrowhead-Crestline	San Bernardino Co.	38,000	Mountain pine beetle Western pine beetle Pine engravers Jeffrey pine beetle	Ponderosa pine Coulter pine Jeffrey pine	Maintenance control, fell-peel-burn or toxic spray, salvage
(13)	Alamo Mountain	Ventura Co.	6,500	Jeffrey pine beetle Calif. flatheaded borer Western pine beetle	Jeffrey pine Ponderosa pine	Sanitation-salvage logging, to be followed by maintenance control
(14)	Barton Flats	San Bernardino Co.	7,500	Western pine beetle Jeffrey pine beetle	Ponderosa pine Jeffrey pine	Maintenance control. Use salvage as much as possible
(15)	Bass Lake	Madera Co.	600	Western pine beetle Pine engravers	Ponderosa pine	Maintenance control, fell-peel-burn or toxic spray
(16)	Big Pines	Los Angeles Co.	2,500	California flatheaded borer	Jeffrey pine	Maintenance control. Use salvage as much as possible
(17)	Charlton Flats	Los Angeles Co.	3,000	Western pine beetle Pine engravers Calif. flatheaded borer	Ponderosa pine Coulter pine Jeffrey pine	Maintenance control, fell-peel-burn or toxic spray, salvage
(18)	Corte Madera	San Diego Co.	1,600	Western pine beetle Pine engravers Calif. flatheaded borer	Coulter pine Jeffrey pine Ponderosa pine	Maintenance control, fell-peel-burn or toxic spray
(19)	Crystal Lake	Los Angeles Co.	1,100	Western pine beetle Mountain pine beetle Jeffrey pine beetle	Ponderosa pine Sugar pine Jeffrey pine	Maintenance control, fell-peel-burn or toxic spray
(20)	Deadman Summit	Inyo NF	10,000	Jeffrey pine beetle Calif. flatheaded borer	Jeffrey pine	Maintenance control. Use salvage as much as possible
(21)	Figueroa Mountain	Santa Barbara Co.	600	Western pine beetle	Ponderosa pine Coulter pine	Maintenance control, fell-peel-burn or toxic spray
(22)	Grade Valley	Ventura Co.	5,000	California flatheaded borer	Jeffrey pine	Maintenance control. Use salvage as much as possible
(23)	Idyllwild-San Jacinto	Riverside Co.	14,500	Calif. flatheaded borer Western pine beetle Pine engravers Mountain pine beetle	Sugar pine Ponderosa pine Coulter pine Jeffrey pine	Maintenance control, fell-peel-burn or toxic spray, salvage
(24)	Laguna Mountain	San Diego Co.	1,500	Western pine beetle Calif. flatheaded borer	Coulter pine Jeffrey pine	Maintenance control, fell-peel-burn or toxic spray, salvage; experimental field tests
(25)	Mount Pinos	Ventura Co.	2,500	California flatheaded borer	Jeffrey pine	Continued sanitation-salvage with maintenance control
(26)	Mill Potrero	Kern Co.	110	Calif. flatheaded borer Pine engraver	Jeffrey pine	Salvage, toxic spray - salvage logging
(27)	Reds Meadow and Tunnel Meadow	Inyo NF	700	Mountain pine beetle	Lodgepole pine	Maintenance control, spray with toxic oil
(28)	Wrightwood	San Bernardino Co.	7,680	Calif. flatheaded borer Pine engraver	Jeffrey pine	Maintenance control, spray with toxic oil

TRUE FIR DWARFMISTLETOE

This form of dwarfmistletoe (Arceuthobium campylopodum Engelm. f. abietinum) is the most widespread pest of red and white fir in California. Heavy damage is apparent in many of the old-growth red fir stands in the Cascades and the Sierra Nevada from Siskiyou County southward to Kern County. Dwarfmistletoe is present in varying amounts in most white fir stands, but damage to this species is considerably less than noted for red fir. Dwarfmistletoe on these two tree species was observed at many other places than those where plot data were taken. Of 64 disease survey plots supporting white fir, 16 had dwarfmistletoe present. These plots had 527 trees, of which 73 or 13.9 percent were infected. Of 17 plots supporting red fir, one or more trees on nine plots had dwarfmistletoe. Seventy-six (42.0 percent) of the 181 red fir trees on the 17 plots were infected.

SUGAR PINE DWARFMISTLETOE

The dwarfmistletoe that attacks western white and sugar pine (A. campylopodum f. blumeri A. Nelson) is patchy in distribution and in sugar pine stands is most commonly found on young trees. Several sizeable areas are under observation where mature trees are heavily infected. One of these spots is in the upper Mokelumne River drainage where dwarfmistletoe is causing severe damage to sugar pine. Here many trees of all ages have been either directly killed by dwarfmistletoe or so weakened that they were easy prey to the mountain pine beetle. Dwarfmistletoe-damaged sugar pine was observed from Siskiyou County south through Los Angeles County. Of 47 survey plots supporting sugar pine, six had one or more dwarfmistletoe-infected trees. There were 135 sugar pines on the 47 plots and of these 11 (or 8.1 percent) were found to be infected.

Figure 5. Dwarfmistletoe canker in bole of red fir encourages heart rots and conditions tree for wind breakage.

HARD PINE DWARFMISTLETOE

Special surveys and detection reports confirm previous evidence about the statewide distribution of the hard pine dwarfmistletoe (A. campylopodum Engelm. f. campylopodum) on ponderosa, Jeffrey, Monterey, digger, and Coulter pines. Dwarfmistletoe is causing heavy mortality of ponderosa, Jeffrey, and digger pines in localized areas. This form of the parasite is most prevalent on trees at poor growing sites such as the Snow Lake area of eastern Plumas County and of the drier eastside type as far south as

the Laguna Mountain area in San Diego County. Severe damage to Monterey pine is still being reported from Monterey County. The heavy infections of dwarfmistletoe in Jeffrey and ponderosa pine at some of the high-use recreational areas in southern California are of much concern to the land managers. This also applies to the digger pine in the recreational areas of the Kern River Canyon. Seventeen of the 64 disease survey plots supporting ponderosa pine had one or more trees infected with dwarfmistletoe. Of 661 trees examined 92 (or 13.9 percent) were infected. Three of the 25 plots containing Jeffrey pine showed dwarfmistletoe infected areas.

In late July and early August a two-man crew from the Plumas National Forest made a pilot survey of a mistletoe infected stand of Jeffrey-ponderosa pine in eastern Plumas County near Snow Lake. This survey crew used a continuous transect strip--eight strips across a section--to obtain detailed information on the occurrence and intensity of dwarfmistletoe on about 1,760 acres of the Milford working circle. Analysis of this survey has not yet been completed, but indications are that roughly 40 percent of the young pines are doomed by the dwarfmistletoe infection now present.

LODGEPOLE PINE DWARFMISTLETOE

The dwarfmistletoe most common on lodgepole pine (A. americanum Nutt.) was observed at several places in the State. Of 14 disease survey plots supporting lodgepole pine two had one or more trees infected with dwarfmistletoe. Of 183 lodgepole pines examined 18 (or 9.8 percent) were found to be infected.

DOUGLAS-FIR DWARFMISTLETOE

Dwarfmistletoe (A. douglasii Engelm) was found in stands of mature Douglas-fir in both Siskiyou and Trinity Counties. The large brooms caused by this parasite on Douglas-fir in the Thompson Creek and East Fork of Indian Creek drainages on the Klamath National Forest could be identified from low-flying aircraft. Many of the infected trees in these drainages are dead or dying while others are deformed and weakened by massive witches' brooms resulting from multiple infection. Dwarfmistletoe rarely occurs on the coastal form of Douglas-fir and has not been found south of Plumas County in the Sierra Nevada. Of 59 disease survey plots having one or more Douglas-fir trees only three plots showed dwarfmistletoe.

ELYTRODERMA NEEDLE DISEASE

Ponderosa and Jeffrey pine stands throughout much of the State again showed varying degrees of infection and intensification of the Elytroderma needle disease (Elytroderma deformans (Wier) Darker). The disease was observed from San Gorgonio Mountain in southern San Bernardino County northward to the Oregon line. At some places, such as Big Pine Flats near Big Bear Lake, nearly every Jeffrey pine showed some infection, and although few dying trees were noted, undoubtedly many were being weakened, resulting in slower growth. The disease tends to recur and to increase in cool moist places. Heavy infections of Elytroderma still exist at such places as the Manzanita Lake Recreational Area, the Lake Tahoe Recreational Area, the Evans Flat area in northern Kern County, the Mokelumne River drainage, and small spots in Glenn and Trinity Counties. Of 64 plots supporting ponderosa pine 17 showed Elytroderma and of 25 plots supporting Jeffrey pine 4 showed this disease to be present.

WHITE PINE BLISTER RUST

There was no noteworthy change in the status of white pine blister rust (Cronartium ribicola Fischer) during 1958. The rust continues to build up on the white pines

at a rapid rate in those areas harboring conditions highly favorable for its development. In between these favorable areas the rust is building up slowly. The disease has made no known advance southward on pine beyond previously noted points at Dodge Ridge in the Sierra Nevada and in western Tehama County in the Coast Range. The intensity of the rust is so heavy in the lower Klamath River country that mature sugar pine is now being killed at a few places. Whitebark and western white pine at the higher elevations in northwestern California are also becoming heavily infected. The rust has not yet been reported on foxtail pine even in areas where the disease is present on other white pine species. Of 47 disease survey plots supporting sugar pine one showed blister rust. (See concluding sentence of disease report, page 27 for significance of percentage of disease occurrence.)

At present about 639,000 acres have been selected by various owners as having sufficient white pine values present to justify control. Of this amount private operators have selected 202,000 acres, the State 10,000 acres, the National Park Service 163,000 acres, and the Forest Service 264,000 acres. Of the 639,000 acres within control units about 526,000 acres have received one or more protective treatments. During 1958, 20,673 acres of State and private lands, 9,729 acres of National Park Service lands, and 31,793 acres of Forest Service lands,

Figure 6. Left. Acti-dione in thick emulsion being applied to blister rust canker in stem of sugar pine, and right to dwarfmistletoe branch canker on white fir. Acti-dione is being successfully used as a systemic fungicide in actual control work in North Idaho white pine region.

or a total of 62,195 acres, had blister rust control work done on them. Nearly all the unworked area within control units lies either outside the limits of the rust spread or in those areas where the rust is less active. No appreciable loss to white pines has occurred within the present control unit boundaries.

Surveys showed that there was no long distance spread of the rust from pine to ribes during the spring of 1958. The general rust spread pattern revealed by correlating location of infected ribes with known pine infection centers showed that most of the spread from pine to ribes occurred in the immediate vicinity of sporulating cankers. Although the pine to ribes spread in the northwestern portion of the State was greater than this general average, it seldom exceeded a mile.

There were 322 samples of rusted ribes leaves received for determination at the Berkeley laboratory. The results are listed as follows:

Origin of sample	Identified as blister rust	Identified as pinyon rust
Amador Co. southward	--	20
Colusa, Sierra-El Dorado Cos.	14	97
Shasta Co. to Plumas Co.	69	119

Only three rust samples were submitted from the area north of Redding-Alturas highway and these were identified as pinyon rust.

PINYON BLISTER RUST

The usual spread of pinyon rust (Cronartium occidentale Hedgcock, Bethel & Hunt) from pinyon trees east of the Sierra Nevada to ribes on the west slope was again noted. The general zone of spread was determined to be from Yosemite National Park northward as far as samples were collected (Shasta County). The intensity of infection was especially light at the southern end of its spread as only five rusted bushes were found even though hundreds were examined.

LIMB BLISTER RUST

The limb rust (Peridermium filamentosum Peck) is still causing heavy damage to some Jeffrey pine stands on the eastside of the Sierra Nevada from Lake Tahoe to Riverside County. The Cannel Meadow area in Tulare County probably has suffered the greatest losses due to bark beetle attack on trees weakened by the limb rust. The heavy damage at the Mammoth Lake area in Mono County and at the San Jacinto Wild area in Riverside County looks about the same as it has for the past few years. Limb rust was not observed on ponderosa pine during the 1958 plot survey work and was found on only two of 209 Jeffrey pines examined.

STALACTIFORME RUST

The stalactiforme rust (Peridermium stalactiforme Arth. et Kern) was noted at several places throughout the State. At the Prairie Fork Recreational area in eastern Los Angeles County this rust was damaging mature Jeffrey pine and had already killed several young trees. Long open trunk cankers on lodgepole pine were noted at several areas in the northern portion of the State. Of 14 plots having lodgepole pine present, stalactiforme rust was found on three plots.

COMANDRA BLISTER RUST

Although comandra rust (Cronartium comandrae Peck) has caused severe damage to ponderosa pine in local areas in the past, no new infection centers were found in 1958.

GALL RUSTS

Gall rusts were reported on lodgepole, Monterey, digger, and ponderosa pines from several places in the State during 1958. Young natural stands and plantation trees are being damaged. The gall rust most common on lodgepole and ponderosa pines (Peridermium harknessii (Moore) Meinecke) occurred on three disease survey plots.

YELLOW WITCHES' BROOM

Yellow witches' broom (Melampsorella caryophyllacearum Schroet.) in red fir was observed at several places in the central and southern Sierra Nevada. This rust had killed many trees and many others were dying near Grass Lake Creek in eastern El Dorado County. Trees of all ages were heavily infected. The red fir at the Cannel Meadow area of Tulare and Kern Counties were heavily infected by this rust. Yellow witches' broom again was reported on white fir in the Daggett Creek drainage of Siskiyou County and in the Little Haskell Creek drainage near Gold Lake in Sierra County. Yellow witches' broom was found on six of 17 plots taken in red fir stands during the disease survey work. Over 12 percent of the trees were infected.

INCENSE-CEDAR RUST

This rust (Gymnosporangium libocedri (P. Henn.) Kern) is quite common on incense-cedar in the northern portion of the State. In some areas it causes considerable damage by killing numerous limbs. Occasionally this accumulative killing of limbs causes the death of mature trees. Mature trees having their upper crown and bole attacked by true mistletoe and their lower crown attacked by the rust end up with insufficient foliage and usually die within a comparatively few years. Incense-cedar was found on 54 of the disease survey plots and the rust was found on trees at 41 of these plots. Of 364 incense-cedar trees examined 53 percent were found to be infected with the cedar rust.

FIR NEEDLE CAST

The fir needle casts mainly caused by Hypoderma robustum Tub. and Hypodermella abietis-concoloris (Mayr) Dearn. are quite often of interest to Christmas tree growers. These needle casts were noted in the Shasta-Lassen area.

PINE NEEDLE CAST

Pine needle cast (Hypodermella medusa Dearn.) was observed on ponderosa pine at several places in the northern end of the State and was reported on Jeffrey pine at the Big Bear Lake area in San Bernardino County. Alone, this needle cast rarely kills a tree. In combination with other diseases it weakens trees and retards their growth.

DOUGLAS-FIR NEEDLE CAST

Although Douglas-fir needle cast (Rhabdocline pseudotsugae Syd.) was rather heavy in the Coast Range a few years ago, none was reported by 1958 detection reports nor was any observed on the disease survey plots.

TRUE MISTLETOES

Two species of the true or leafy mistletoes worthy of mention were observed at many locations in the State. The white fir mistletoe (Phoradendron pauciflorum Torr.) was observed from El Dorado County southward. The tops of numerous firs were either killed by the mistletoe or were so weakened that they were readily attacked by fir engraver beetles. The heaviest infections were in the southern part of the State. Another species of true mistletoe (P. libocedri Howell) attacks incense-cedar. It was observed throughout the State but is much heavier in the northern portion where it has killed the tops of many mature trees. True mistletoes reduce the growth of heavily infected mature trees.

FOMES ROOT DISEASE

The Fomes root disease (Fomes annosus (Fr.) Cke.) as previously reported is still killing scattered patches of young trees of ponderosa and Jeffrey pine in east-side Sierra logged-over areas. The disease was also reported from San Bernardino County.

LEPTOGRAPHIUM ROOT DISEASE

Several spots (1 to 10 acres each) of dead and dying pinyon pine caused by Leptographium spp. were observed to be scattered over about 2,000 acres in the Big Bear Lake area in San Bernardino County. This root disease is killing some pole-size ponderosa and Jeffrey pine at Blacks Mountain Experimental Forest in Lassen County as well as small groups of ponderosa pine in northeastern Amador County.

ARMILLARIA ROOT DISEASE

The armillaria root disease (Armillaria mellea (Vahl.) Quel.) is the most widely distributed of the root diseases. Although it attacks mostly hardwoods, it frequently kills coniferous reproduction as well as larger trees. There are some especially active areas in white fir stands in Shasta County.

MISCELLANEOUS DISEASES

Many tree diseases of minor importance were reported from various parts of the State during the summer. Due to an unusually wet spring coupled with frequent summer showers, some of these normally endemic diseases reached epidemic status in 1958. The oaks were attacked by the oak leaf fungus (Septoria quercicola Sacc.), which caused partial and in some cases complete defoliation by mid-August. California black oak was particularly hard hit. Another leaf disease, the oak anthrocnose (Gnomonia veneta Sacc & Speg.), although not so virulent assisted in the defoliation. Many of the mildews were exceptionally heavy on the oaks.

A bacterium and two fungi (Kabatiella sp. and Gloeosporium sp.) were found to be attacking the leaves of California-laurel in coastal counties. Many infected trees were partially or completely defoliated and often the twigs blackened and died. Severely infected trees turn brown as if the entire crown had been killed by fire.

Rusts were unduly heavy on several of the deciduous tree species during late summer. This was particularly true of the rusts on poplars and willows (Melampsora spp.) in the northern portion of the State. The aspen blight (Marssonina populi (Lib.) Magn.) caused early defoliation of aspen at many places in northeastern California.

DISEASES OF UNDETERMINED CAUSE

Land managers in the Crestline and Arrowhead areas in San Bernardino County are still greatly concerned about an undetermined disorder (X-disease) that is

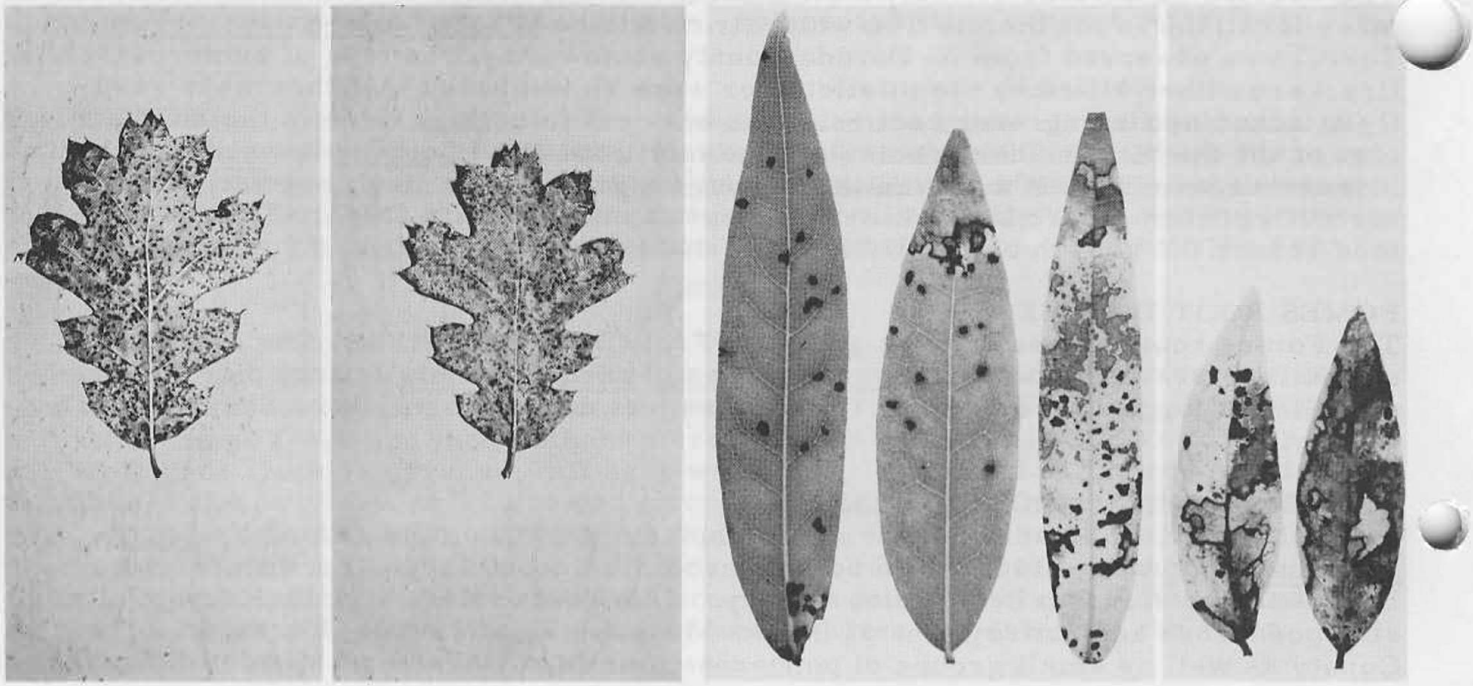


Figure 7. Left. Lower and upper surface of black oak leaves heavily hit by oakleaf fungus (Septoria quercicola). Right. Five leaves of California laurel in several stages of damage from fungi and a bacterium.

weakening and killing ponderosa pine. The size of the area involved is increasing annually. Most of the spread is to the north and northeast. The needles on affected trees generally turn a grayish yellow, often following a mottled pattern, and then drop. Each year's needles become shorter than those of the previous year and when the disease reaches the advanced stage often only the current season needles remain on the tree. Generally a tree lives only 3 or 4 years after it shows the first symptoms of attack. Some evidence suggests that the damage results from air pollutants while other evidence points toward a root fungus or root disorder.

Another unknown disease that affects the foliage of Jeffrey pine was noted for the first time this year at Raywood Flat in southern San Bernardino County. Jeffrey pine over an area of about 600 acres shows a type of foliage blight. The top of the crown becomes affected first and then the blight works down the crown of the tree. By the time the lower crown is affected the upper crown is dead or dying. The blight differs from X-disease in that the latter involves the entire crown from the onset of the disorder. From field observations it appears that at least 6 to 10 years elapse from the first symptoms of the blight until the tree dies.

An unknown foliage blight of lodgepole pine was again reported from Tuolumne Meadows in Yosemite National Park. A similar appearing blight was also reported from Strawberry in Tuolumne County, at several places in the Clarks Fork River drainage in Alpine County and near Dinkey Creek in Fresno County.

The unknown canker disease that has been killing branches of white fir trees at Evans Flat in Kern County was reported again from the same area.

Table 5 summarizes information obtained from the disease survey plots indicating the occurrence and intensity of diseases and the principal conifers affected. Again, it should be emphasized that the data for 125 plots of 25 trees each, a total of 3,125 trees, are accurate for these randomly located plots but are insufficient in volume to warrant predictions of disease conditions for the State.

TABLE 5.--SUMMARY OF 1958 FOREST DISEASE SURVEY PLOT DATA

Tree species	Total sample		Infection by number of plots and by number of trees																	
	Unit	No.	Dwarfmistletoe	Elytroderma	H. medusa	P. harknessii	P. stalactiforme	P. filamentosum	C. ribicola	Blue brooms	True mistletoe	Gymnosporangium	H. abietis-concoloris	Melampsorella	Unclass. foliage	E. tinctorium	Fomes pini	P. schweinitzii	A. mellea	Unclass. heart rot
Ponderosa pine	Plots	64	17	17	1	2									1		2			27
	Trees	661	92	66	2	2									1		2			52
Jeffrey pine	Plots	25	3	4				1							1					8
	Trees	209	9	11				2							1					19
Sugar pine	Plots	47	6						1	3							1			15
	Trees	135	11						1	3							1			21
Lodgepole pine	Plots	14	2	1		1	3								1					6
	Trees	183	18	1		2	4								3					22
Incense-cedar	Plots	54									16	41								3
	Trees	364									38	193								5
White fir	Plots	64	16								1		1		1	2	1	1		41
	Trees	527	73								1		1		1	3	2	1		172
Red fir	Plots	17	9											6	2	3			1	14
	Trees	181	76											22	2	5			1	55
Douglas-fir	Plots	59	3												1		25	5		36
	Trees	615	5												1		88	6		136
Redwood	Plots	9																		4
	Trees	153																		108
Juniper	Plots	6									3									3
	Trees	25									7									4
Knobcone pine	Plots	2	1														1			
	Trees	4	2														1			
Western hemlock	Plots	4	1																1	3
	Trees	21	5																1	5

1/ Other tree species occurred less frequently on the plots in the numbers indicated: western white pine (16), mountain hemlock (12), digger pine (8), Sitka spruce (7), whitebark pine (2), grand fir (1), Port Orford cedar (1). All of these appeared to be free of disease.

RECOMMENDED ACTION ON MAJOR FOREST DISEASES

The timbered areas having disease problems for which some method of control is practicable are listed in the following tabulation.

Location	Disease	Host trees	Control or recommendation
Commercial forests of entire State	Dwarfmistletoe	Red fir Ponderosa pine Jeffrey pine Sugar pine White fir	Where economical, control by silvicultural methods during logging. Favor mixed stands.
		Douglas-fir	Control in small blocks through clearcut, burn and plant is especially adaptable.
Kern River Recreational Areas	Dwarfmistletoe	Digger pine	Control through sanitation cutting and pruning. Favor other tree species when planting.
Southern California high use and recreational areas	Dwarfmistletoe	Jeffrey pine Ponderosa pine	Control through sanitation cutting and pruning. Favor other tree species when planting.
Kern County	Elytroderma needle disease	Ponderosa pine Jeffrey pine	Salvage and high risk cutting.
Mokelumne River	Elytroderma needle disease	Ponderosa pine	Salvage and high risk cutting.
Lake Tahoe and Lassen Volcanic National Park	Elytroderma needle disease	Ponderosa pine Jeffrey pine	Remove heavily infected trees. Favor other tree species in heavy infection centers. Plant to retain mixed-species stand.
Glenn County	Elytroderma needle disease	Ponderosa pine	Salvage and high risk cutting.
Tulare and Mono Counties	Limb rust	Jeffrey pine	Risk-mark all infected trees for cutting.
Sierra Nevada and North Coast Range	White pine blister rust	Sugar pine	Control by destroying all ribes bushes in sugar pine management units.
Lassen Volcanic, Yosemite, and Sequoia-Kings Canyon National Parks	White pine blister rust	Sugar pine Western white pine Whitebark pine Foxtail pine	Control by destroying all ribes bushes in areas of high aesthetic or other Park values.
San Bernardino County	Unknown disorder (X-disease)	Ponderosa pine	Further research needed.

STATUS OF FOREST ANIMAL PESTS DURING 1958

Specific information on the status of animal damage to California forests is fragmentary. Among animal pests known to cause damage in California are bears, stripping bark from redwood and Douglas-fir in northwestern California; elk and deer trampling and browsing on planted and natural coniferous seedlings; rabbits clipping the tops of plants and natural small coniferous seedlings; porcupines girdling various species of conifers, both planted and natural; squirrels girdling small coniferous limbs and tops as well as feeding on seeds of a variety of trees; mice destroying coniferous seed, both planted and natural, as well as debarking brush; and birds also destroying coniferous seed.

Only 5 detection reports were received on animal pests for the State for 1958. These reports indicate that mice have caused considerable damage in debarking brush and eating tree seed this year. Woodrats were reported stripping bark and girdling the tops of redwood trees in Mendocino County. Browse damage by deer to young plantations appears to have increased in 1958. Extensive damage by porcupines continued; but on forested areas where control has been conducted for the past two years the national forests reported about 5,300 porcupines killed in 1958 compared to about 5,200 killed in 1957. On these control areas there was a decrease in damage. Control of tree seed-eating rodents was carried on on 1,812 acres of national-forest land in cooperation with the U.S. Fish and Wildlife Service.

Considerable concern was expressed by Council members over lack of information on the amount of damage caused by forest animals, and lack of knowledge about their control. Substantial sums are being spent to combat porcupines alone, and better, more effective methods are needed to deal with these and other animal pests in California Forests. Research to devise ways of controlling seed-eating rodents has been intensified during the past year. However the current level of effort directed toward solving animal pest problems, particularly porcupines, seems to be considerably short of needs. These views were embodied in a resolution adopted by the Council. The Council also recommended that a subcommittee on animal damage be appointed by the Council Chairman.

Figure 8. Effective porcupine control depends on a good dog, a gun and poisoned salt blocks.

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